

# RMA Analysis for possible life extension (2017-18)

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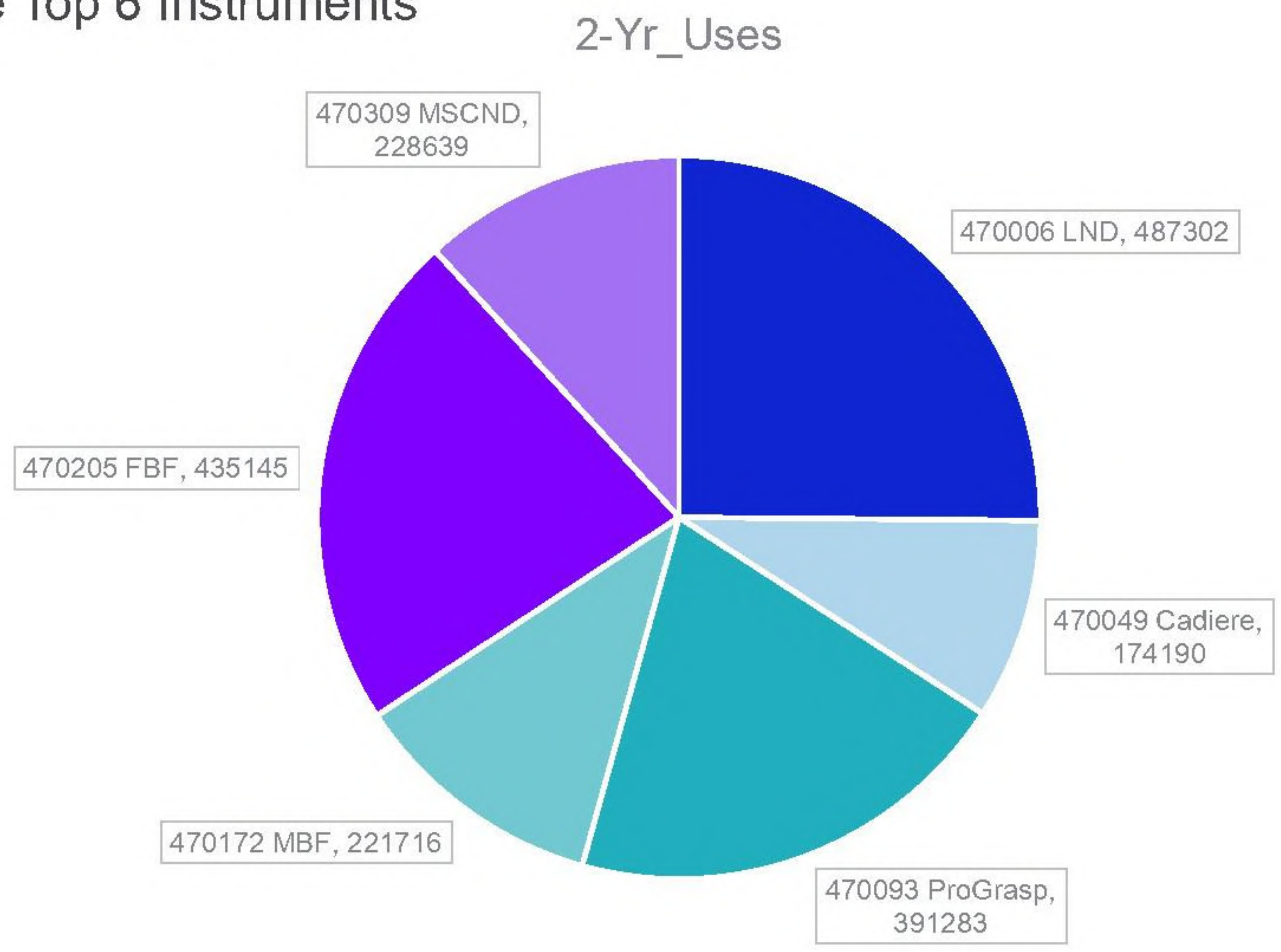
Core Instruments 2019 Efforts

*NPV + Core Instruments*

January 29, 2019

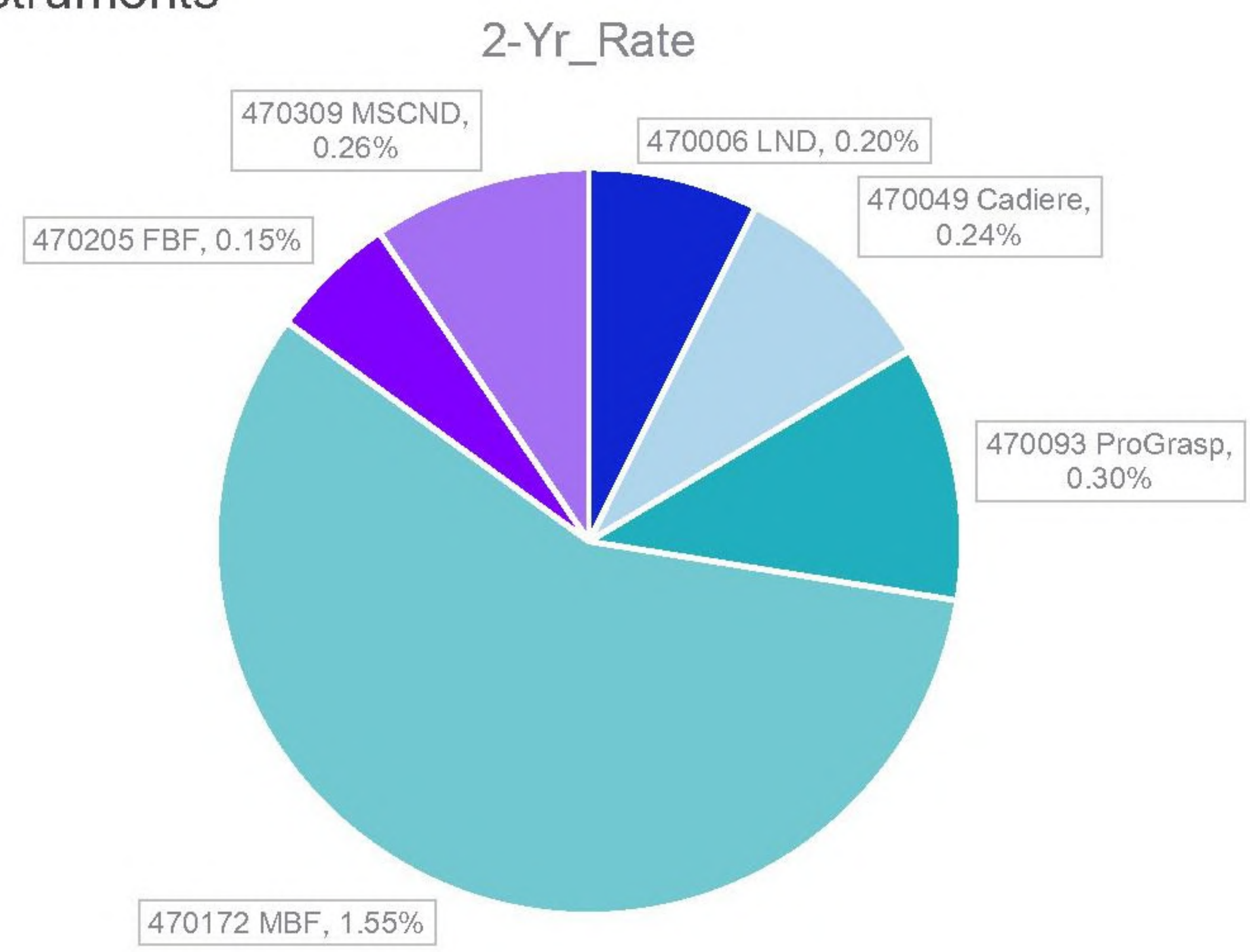
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**218592 Instrument uses in 2018**  
for the Top 6 Instruments





# RMA's Rates for Top 6 Instruments

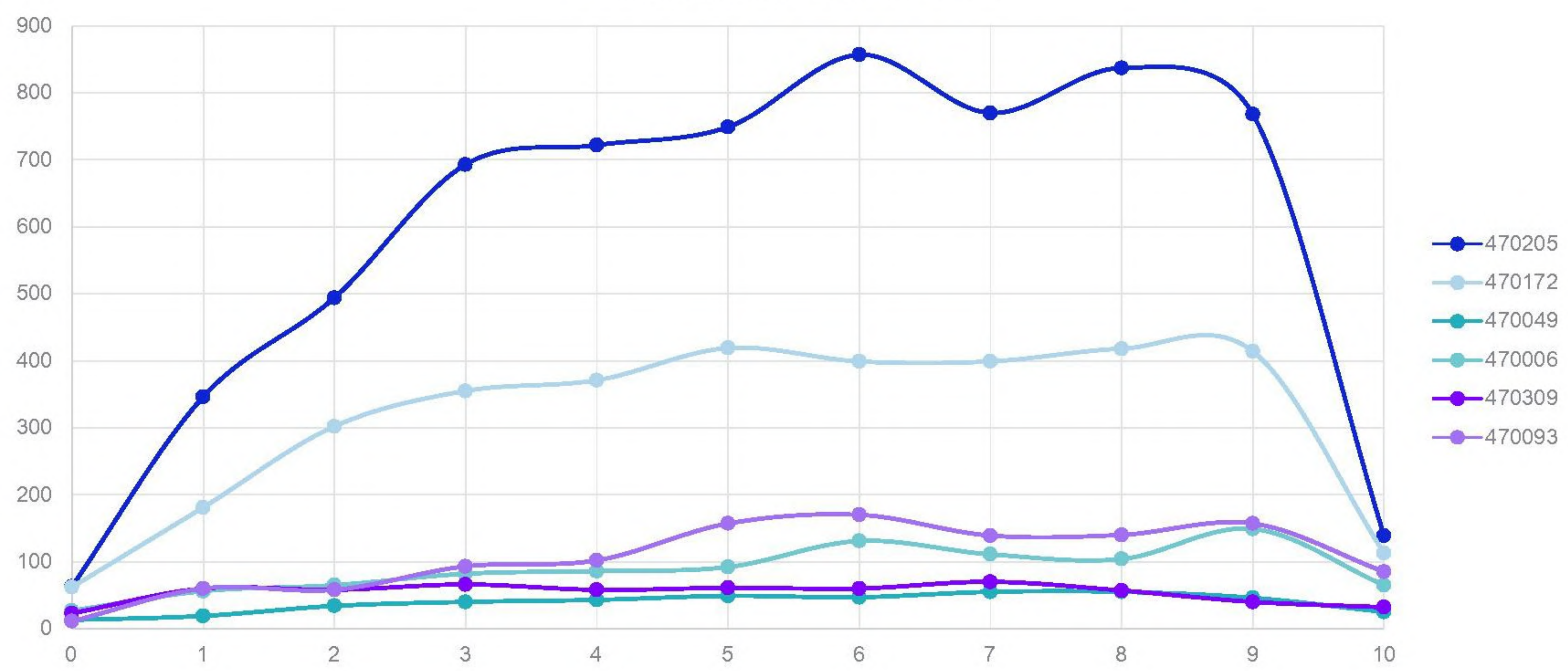




## RMA in 2018 for Top 6 Instruments

Analysis by Lives Expired

2-Yr. RMA vs. Expired Lives



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RMA­s in 2018 for Top 6 Instruments

Analysis by Lives Expired

2-Yr. RMA­s vs. Expired Lives

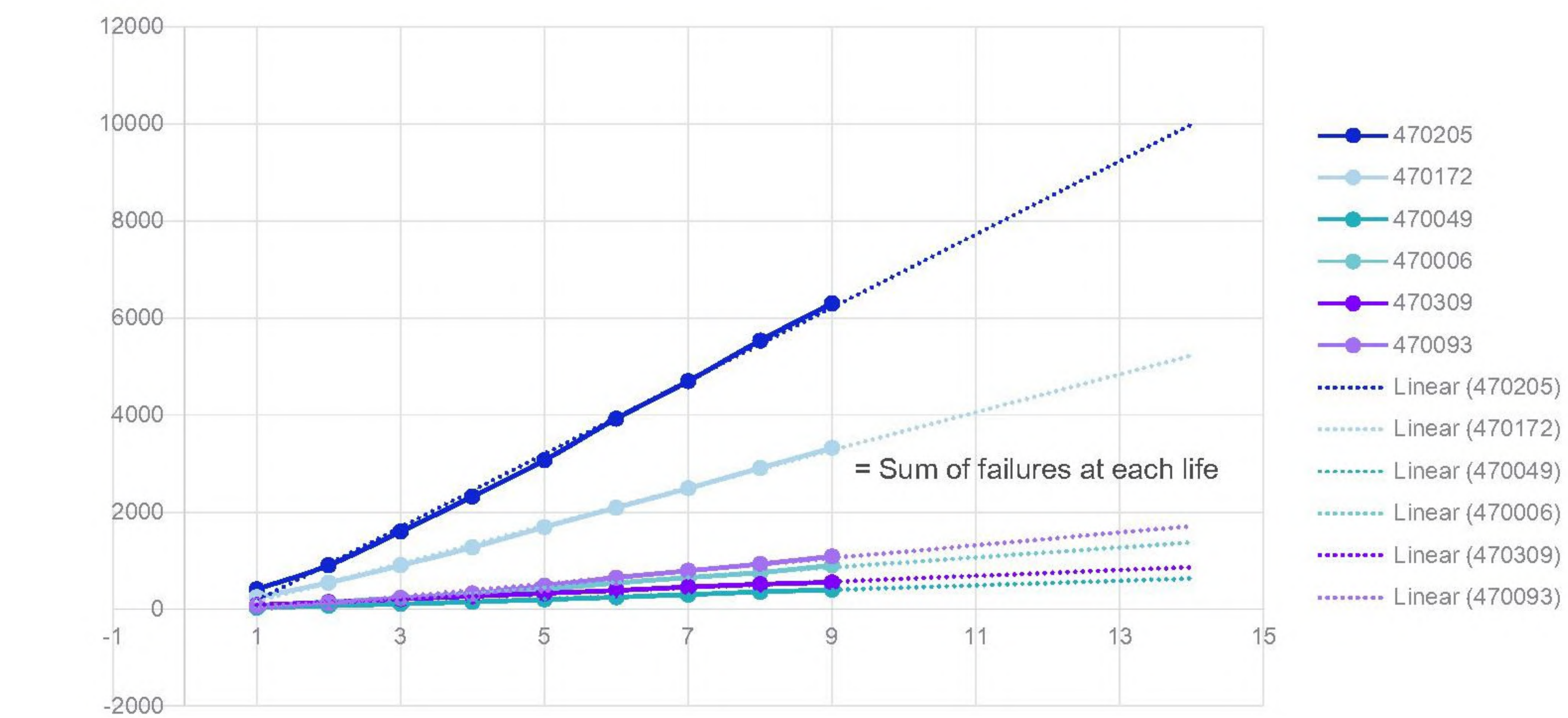
Expired Uses	470205	470172	470049	470006	470309	470093	Total
New - 0	63	62	13	27	23	11	199
1	346	181	19	56	60	60	722
2	494	302	34	65	58	58	1011
3	693	355	40	82	66	93	1329
4	722	371	43	86	58	102	1382
5	749	419	49	92	61	157	1527
6	857	399	47	131	60	170	1664
7	770	399	55	111	70	139	1544
8	837	418	55	104	57	140	1611
9	768	414	46	149	40	157	1574
Expired - 10	139	113	25	65	32	85	459
Total	6438	3433	426	968	585	1172	13022



## Projected RMA volume

Linear predictions by Instrument

2-Yr Cumulative RMA vs. Expired Lives



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RMA­s in 2018 for Top 6 Instruments

Analysis by Lives Expired

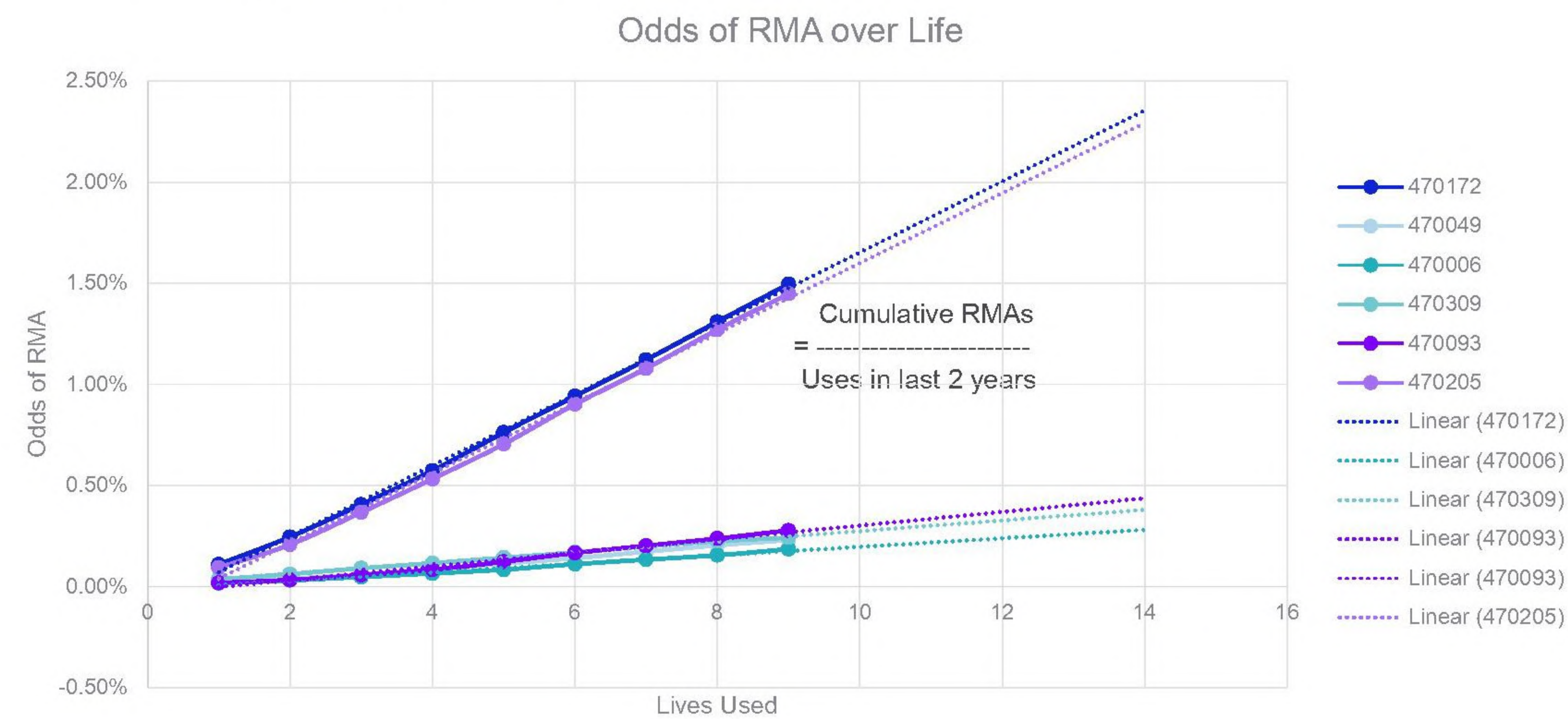
2-Yr. Cumulative RMA­s vs. Expired  
Lives

Cumulative							
Expired Uses	470205	470172	470049	470006	470309	470093	Total
New - 0	63	62	13	27	23	11	199
1	409	243	32	83	83	71	921
2	903	545	66	148	141	129	1932
3	1596	900	106	230	207	222	3261
4	2318	1271	149	316	265	324	4643
5	3067	1690	198	408	326	481	6170
6	3924	2089	245	539	386	651	7834
7	4694	2488	300	650	456	790	9378
8	5531	2906	355	754	513	930	10989
9	6299	3320	401	903	553	1087	12563
Expired - 10	6438	3433	426	968	585	1172	13022



# Odds of RMA

Linear predictions by Instrument



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**RMA**s in 2018 for Top 6 Instruments  
Analysis by Lives Expired

2 Yr. Usage / Cumulative RMA

Odds by lives remaining								
Expired								
Uses	470205	470172	470049	470006	470309	470093	Total	
0	0.01%	0.03%	0.01%	0.01%	0.01%	0.00%	0.01%	
1	0.09%	0.11%	0.02%	0.02%	0.04%	0.02%	0.05%	
2	0.21%	0.25%	0.04%	0.03%	0.06%	0.03%	0.10%	
3	0.37%	0.41%	0.06%	0.05%	0.09%	0.06%	0.17%	
4	0.53%	0.57%	0.09%	0.06%	0.12%	0.08%	0.24%	
5	0.70%	0.76%	0.11%	0.08%	0.14%	0.12%	0.32%	
6	0.90%	0.94%	0.14%	0.11%	0.17%	0.17%	0.40%	
7	1.08%	1.12%	0.17%	0.13%	0.20%	0.20%	0.48%	
8	1.27%	1.31%	0.20%	0.15%	0.22%	0.24%	0.57%	
9	1.45%	1.50%	0.23%	0.19%	0.24%	0.28%	0.65%	
10	1.48%	1.55%	0.24%	0.20%	0.26%	0.30%	0.67%	



# Reliability Analysis

Using Kaplan Meier and Weibull Analyses



Data

Latest Part Version of each of the base partnumbers considered in this analysis

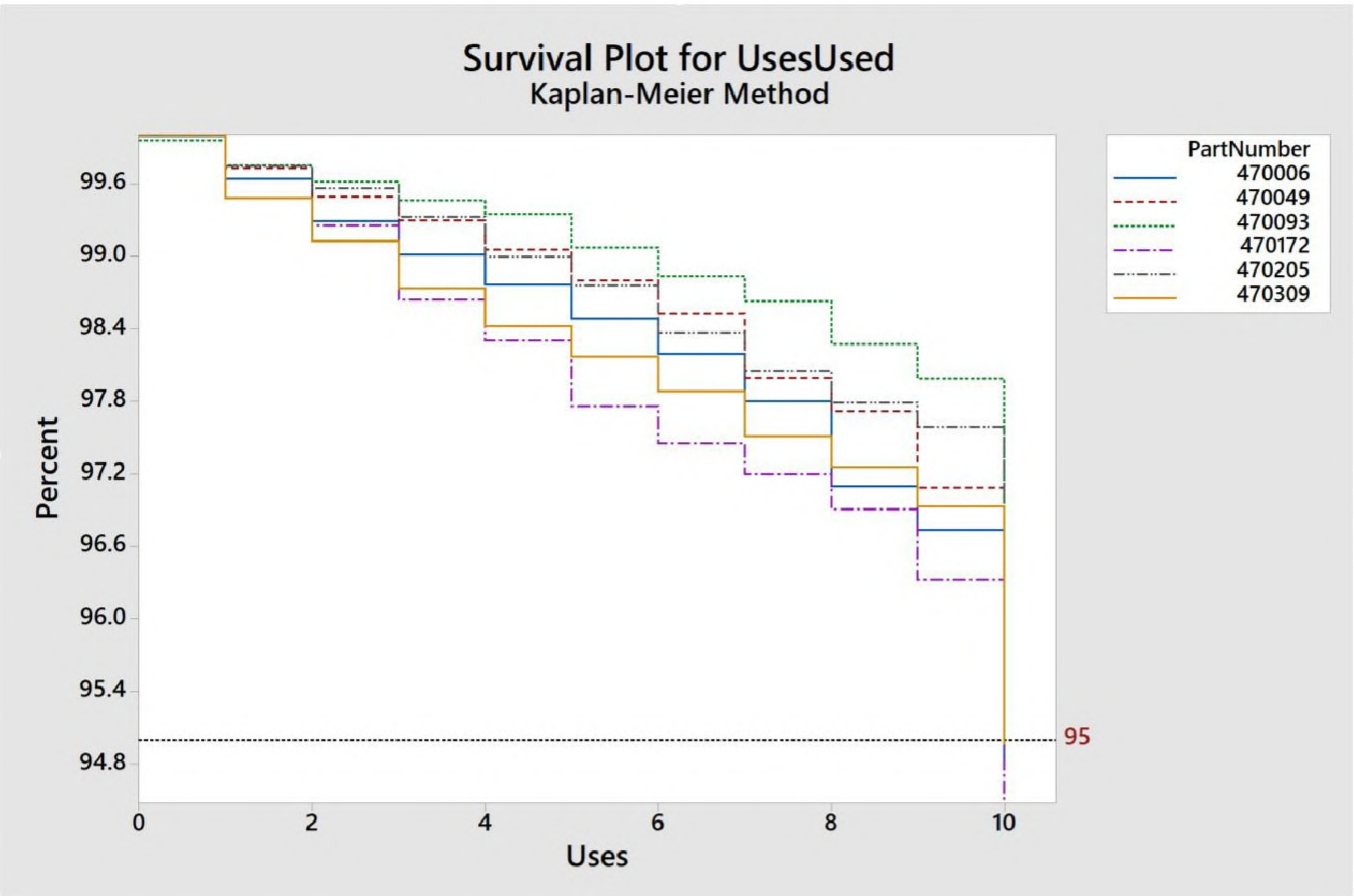
PartNumber	N (# of Instruments)
470006-12	11683
470049-06	6196
470093- 11	10117
470172-16	5178
470205-17	13037
470309-14	7112

Data obtained from the tools used table, for production level instruments (release level = 63)

- at least one use (for Weibull analysis).

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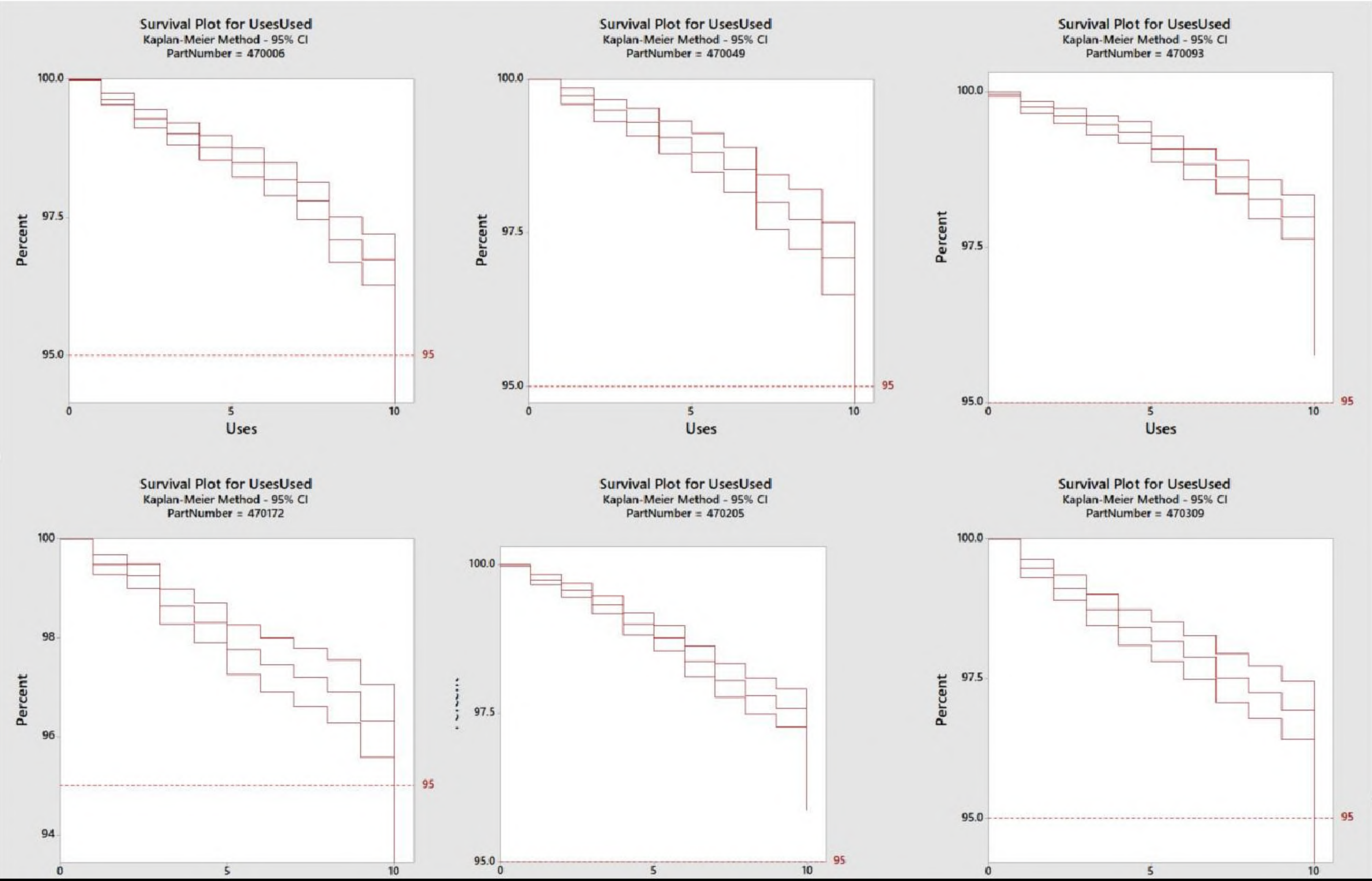




- Using Non-Parametric method for estimating reliability
  - Kaplan Meier method
- Using censoring if an instrument does not fail at the end of 10 lives
- Since we do not have data past 10 lives the reliability drops at the 10<sup>th</sup> use.
- All part numbers have a > 95% probability of surviving the 10 lives
- Best case reliability
  - 470093 (Prograsp)
- Least reliable of these part numbers
  - 470172 (Maryland)



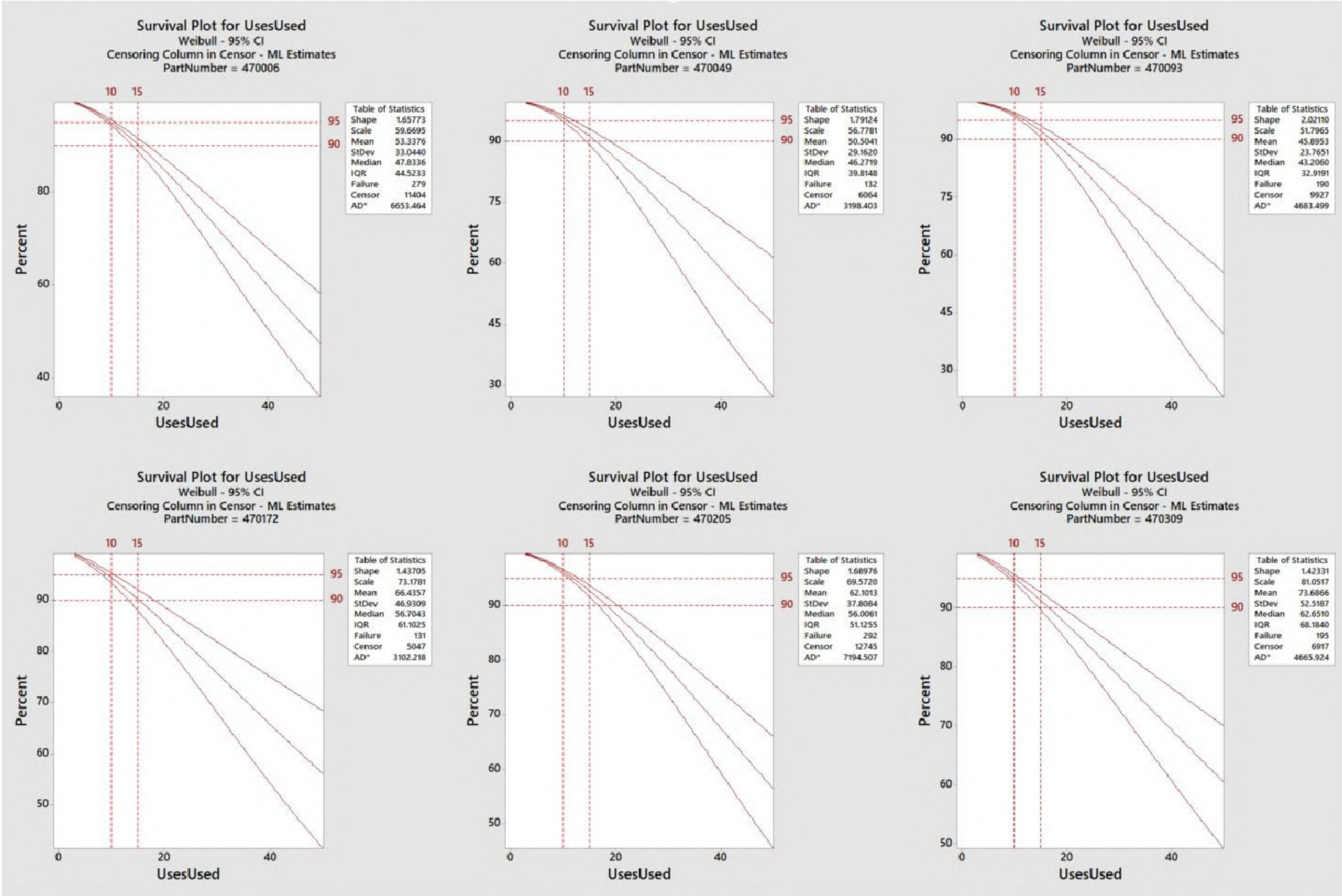
Kaplan Meier for each Part Number with confidence bounds



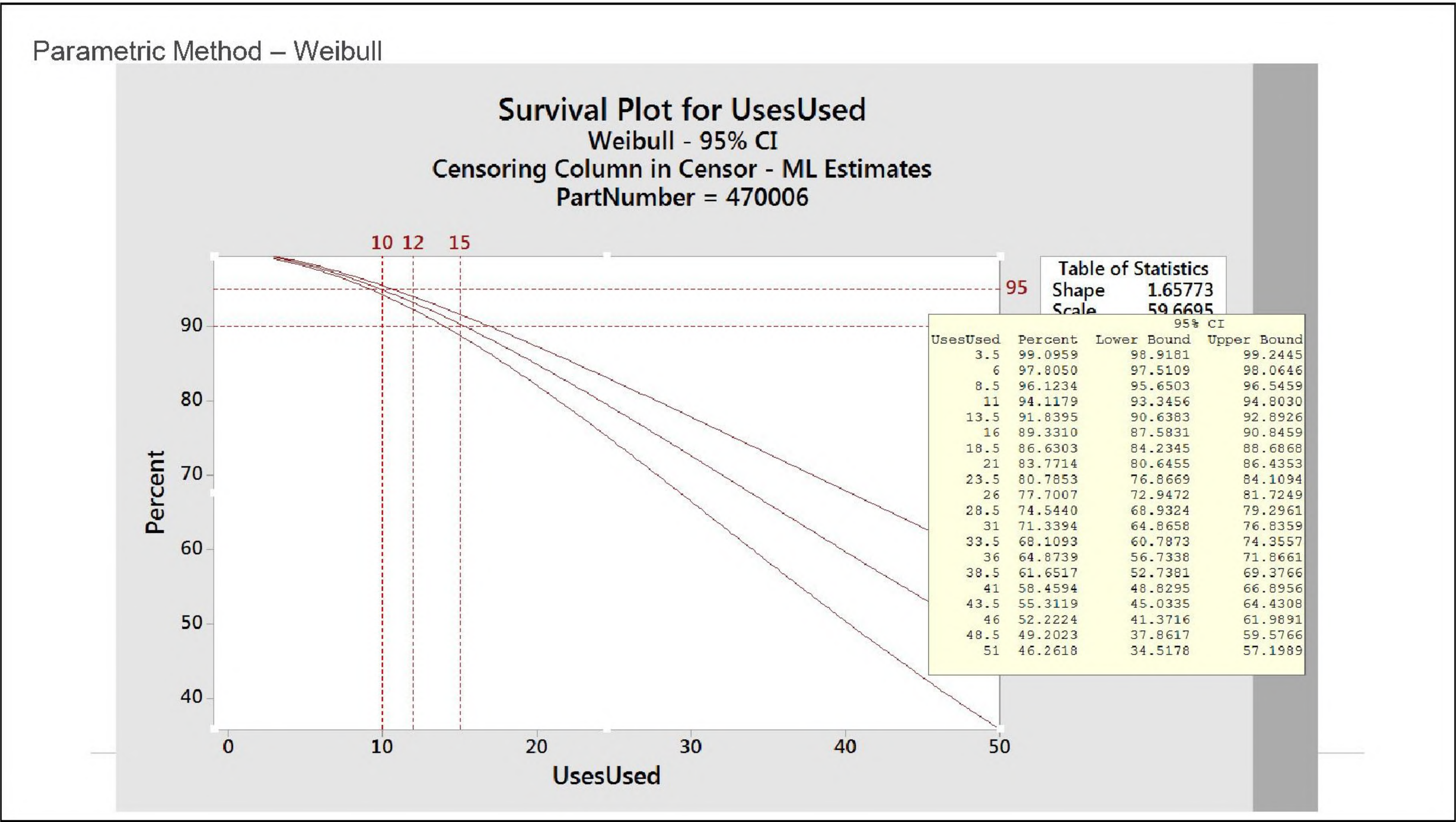
In all cases the lower confidence bound on the survival estimate is greater than 95%.



Parametric Method – Weibull

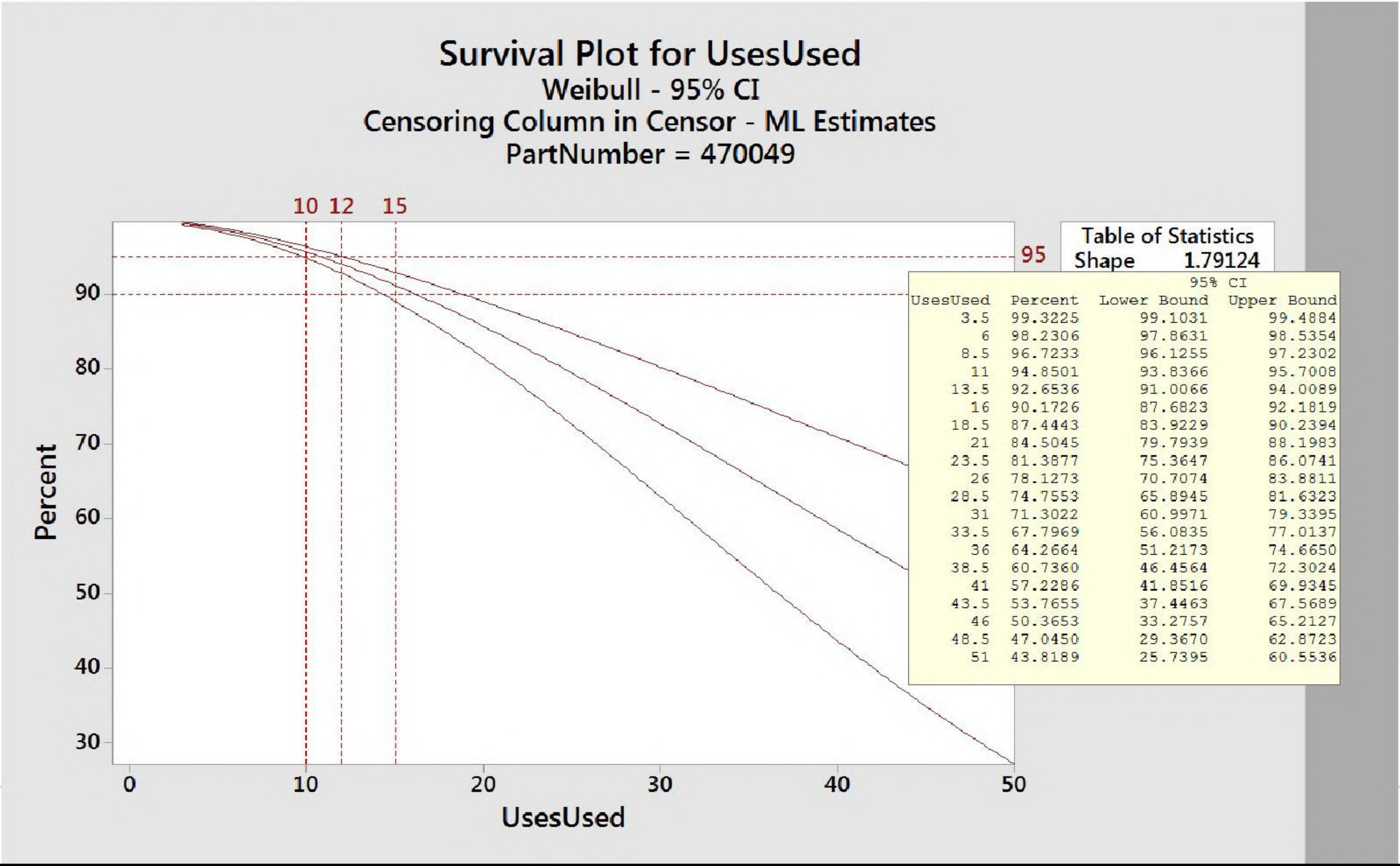




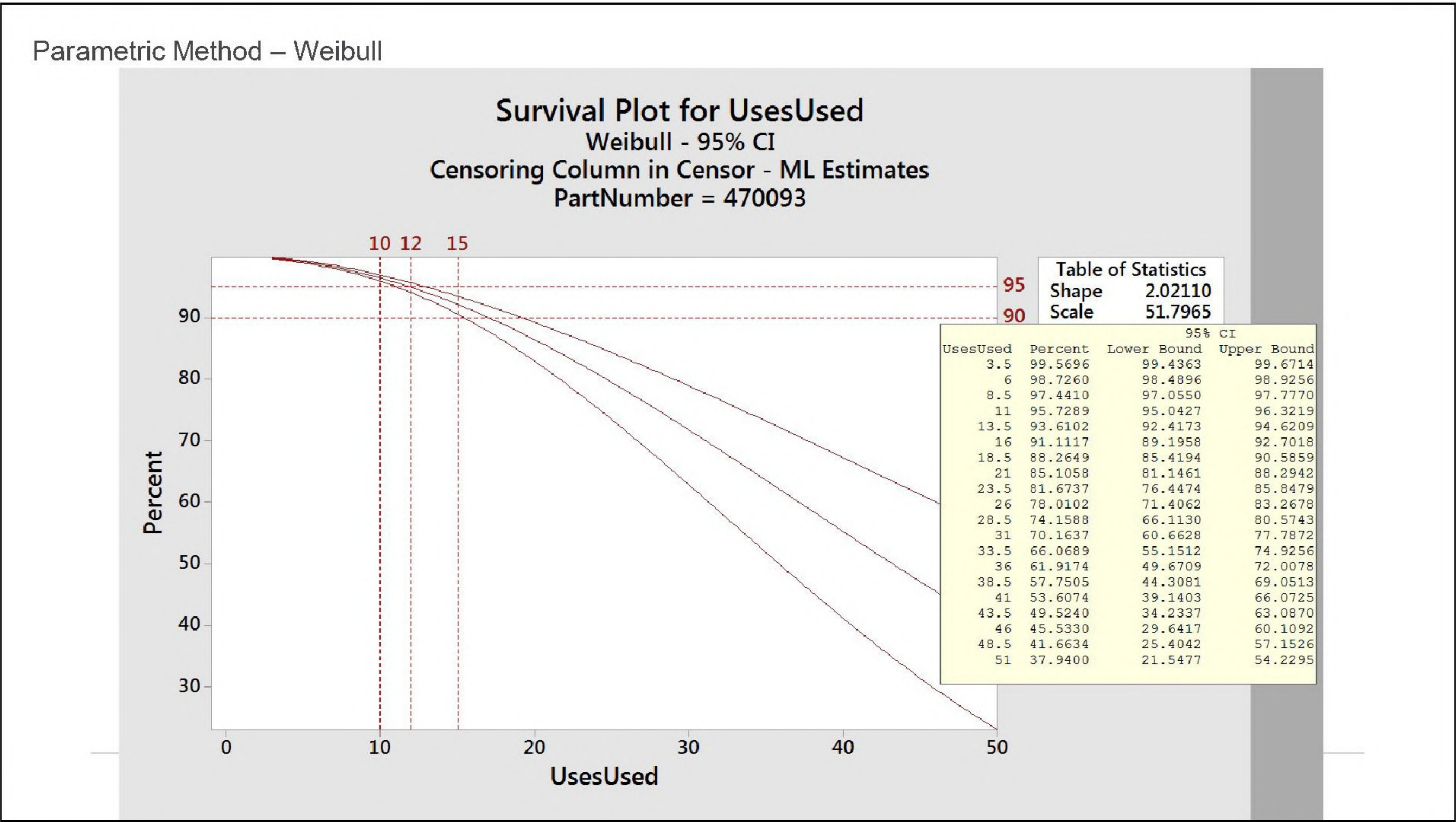




Parametric Method – Weibull

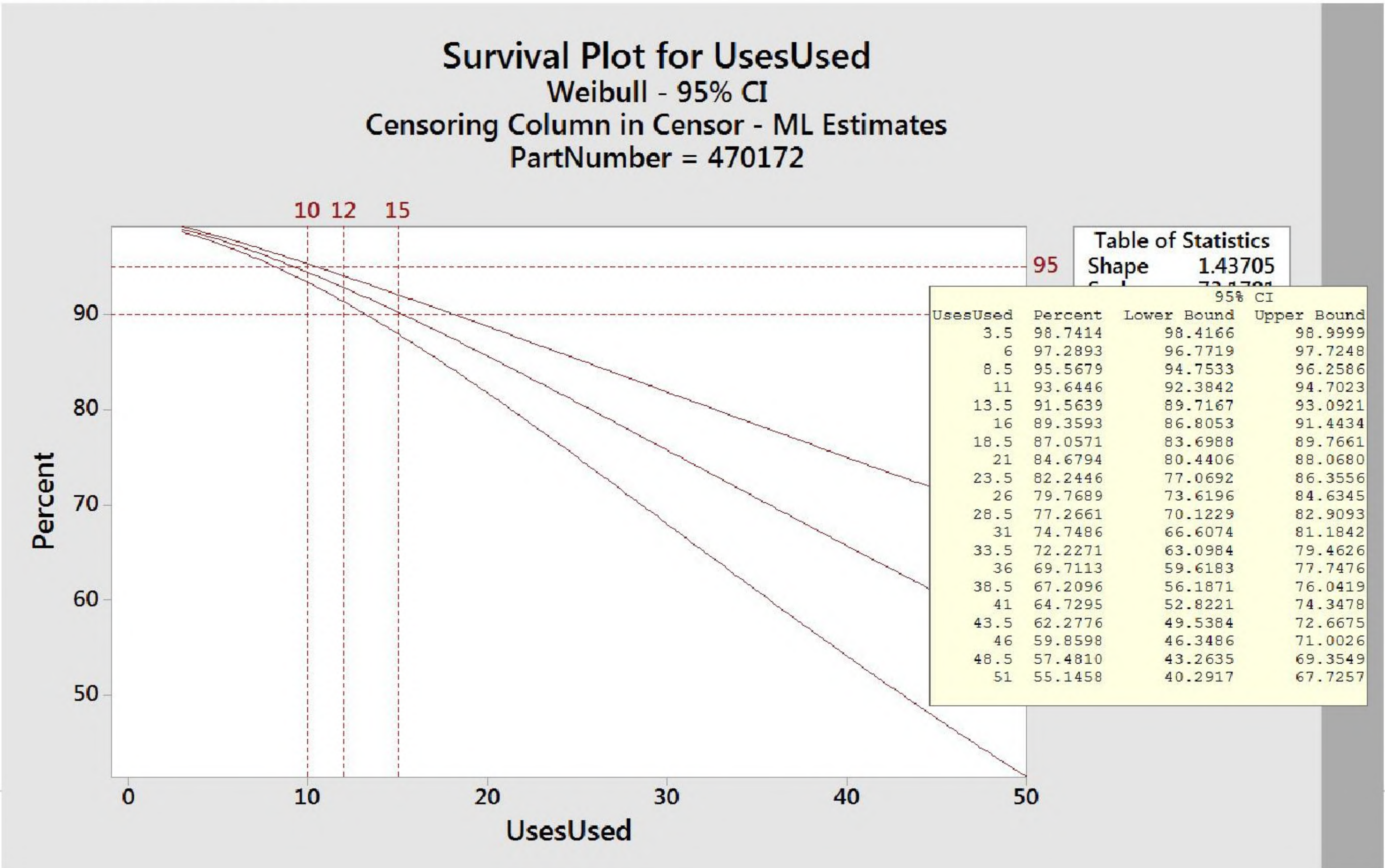




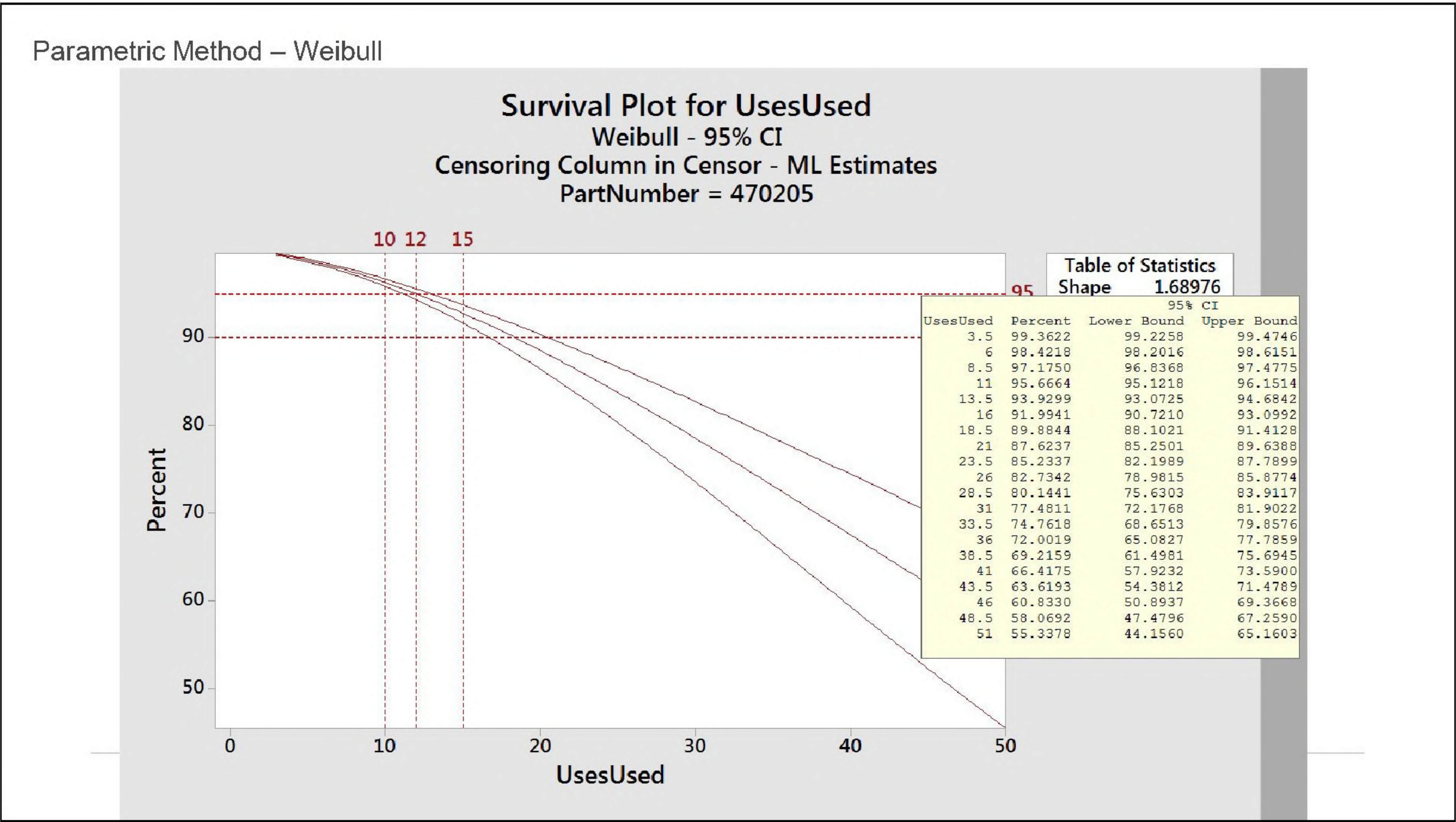




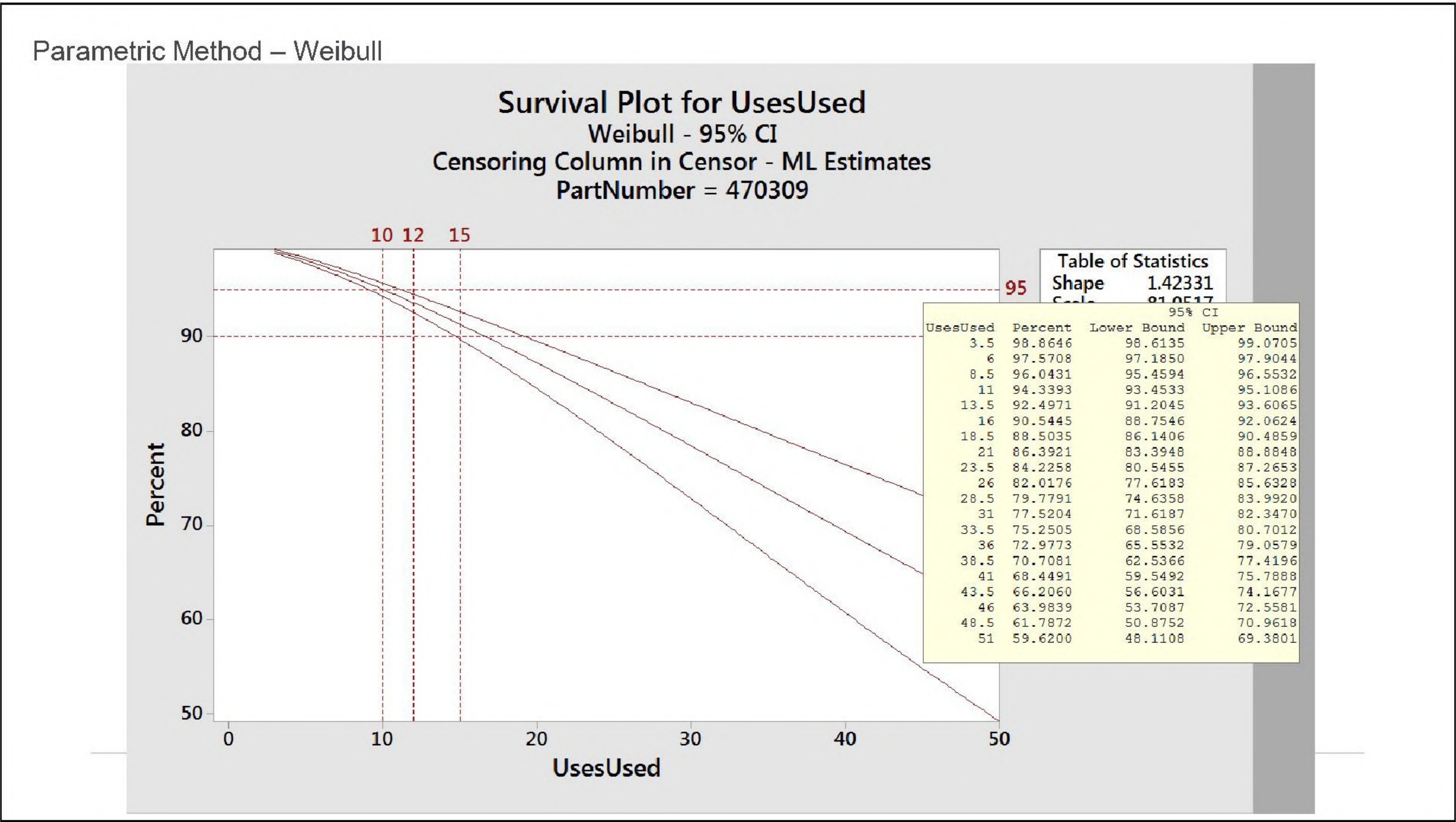
Parametric Method – Weibull













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